Pharmaceutical Design and Engineering – DTU

Master project proposal

PROJECT TITLE (preliminary, can be changed later):

Two project are available with the common title
"Nanotherapies for enhancing the effect of cancer radiotherapy"

PROPOSER / PROJECT SUPERVISOR (include contact details):

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PROJECT LOCATION (company name and address):

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PROJECT SYNOPSIS (½ page):

The main aim of the project is to develop drug delivery technology of radiosensitizers for enhancing the therapeutic effect of cancer radiotherapy and show the potential of this strategy by evaluation in cancer cell cultures. Two projects are available, one focusing on developing sustained drug delivery systems for local injection into the tumor and one project focuses on systemic administration of nanocarrier systems with focus on use of liposomes as drug carriers.

Modern radiotherapy is a tightly balanced process of eradicating the cancerous tissue and avoiding serious side effects. This balance determines the therapeutic outcome when treating cancer patients, which may be improved by increasing the spatial precision of radiotherapy, or selectively increasing the radiobiological sensitivity of cancer cells. Drug delivery systems combined with modern radiotherapy offer a unique possibility for a dual-targeting mechanism for hitting the cancer cells thereby providing a combined cumulative treatment effect without increasing side effects.

It is a specific aim in the project to develop drug delivery formulations where the drug release kinetics can be controlled. For the radiosensitizer drugs under investigation, it is necessary to utilize an activation mechanism that optimizes the drug concentration in the tumor to potentiate the effect of radiotherapy. One of the activation methods that will be tested is based on the use of matrix metalloproteases (MMP), which are known to be over-expressed in a broad range of cancer types.

If the two projects are successful, we will be the first to:

- **Project 1:** Develop liposome radiosensitizing chemotherapy formulations for enhancing the effect of radiotherapy using tumor targeted liposomes.
- **Project 2:** Investigate the feasibility of administering a hydrogel system containing radiosensitizer drugs that are released directly into the tumor and potentiate the effect of radiotherapy.

The projects can be structured in a way where students with both a chemistry and biology background will be scientifically challenged and be able to successfully work on the goals of the projects.

Certain parts of the project may be carried out in collaboration with the small Danish biotech company Nanovi, www.nanovi.dk.